

REMARKS ON FILARIA.

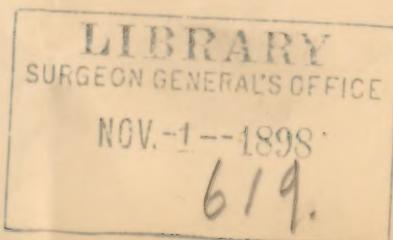
BY FREDERICK P. HENRY, M. D.

The case which is the basis of my remarks belongs to one of a group of diseases included under the generic term "filariasis," by which is understood an affection caused by one or other species of *Filaria*. This parasite is by no means rare in the lower animals, especially in the dog, but I will confine my remarks to those *Filariae* which infest the blood of man. Of these, three species are universally recognized: (1) *Filaria sanguinis hominis nocturna*, (2) *Filaria sanguinis hominis diurna*, (3) *Filaria perstans*. This classification is based upon the habits of the filarial embryos, the first species being found in the superficial vessels solely or chiefly during the night; the second solely or chiefly during the day, while the third is constantly present in the cutaneous capillaries.

There is a fourth species recently discovered by Dr. Patrick Manson, formerly of Amoy, China, now of London, which he has modestly named *Filaria Demarquayi*, after Demarquay, the discoverer of *Filaria nocturna*.

Filaria diurna and *Filaria perstans* are confined thus far to the West of Africa and adjoining districts, while the *Filaria nocturna* is widely prevalent in the tropics and endemic in certain sections of the United States. The adults of *Filaria nocturna* have been frequently found; that of *Filaria perstans* never, so far as I have been able to ascertain. In the opinion of Manson the *Filaria loa* of the eye of the negro of Old Calabar is probably the adult form of the *Filaria diurna*. If it is not, he argues, then there must be another blood worm yet to be discovered, for the embryos of the *loa* must escape from the body of their host through the medium of the circulation. *Filaria perstans* has been practically proved by Manson to be the cause of the fatal "sleeping sickness" of the Congo region.

While engaged in the study of filariasis my attention was called by Dr. Charles A. Oliver of Philadelphia, to a remarkable case of *Filaria loa* recently reported by Dr. Argyll Robertson, the distinguished ophthalmologist of Edinburgh. The patient was a lady who had spent eight years in missionary work at Old Calabar on



the West Coast of Africa. Without entering into the details of this most interesting case I will merely state that in two successive operations Dr. Robertson extracted two Filariae (species *loa*) from the ocular tissues, the first a male the second a female. Both of these adult parasites are described by Manson in the course of Robertson's paper. The female was stuffed with embryos but repeated examinations of the blood failed to detect any embryonic Filariae in that fluid. This fact seems to refute Dr. Manson's hypothesis that *Flaria loa* is the adult form of *Flaria diurna*.

The fact that the case on which my remarks are based is the first of the kind observed in Philadelphia justifies the publication of a life-history of the parasite, *Filaria nocturna*, which I found in the blood of my patient and of which living specimens are placed under the microscope. I wish, therefore, to emphasize the fact that Filariae in the blood vessels are undeveloped, embryonic, and that they are the progeny of an adult, two or three inches long, which has its permanent abode in one of the lymphatic channels, probably the thoracic duct. Manson, observing the embryonic characters of the circulating Filariae, came to the inevitable conclusion that they must reach a further stage of development outside of the body and, in all probability, in the interior of some blood-sucking animal. He naturally thought of the mosquito, an insect whose nocturnal blood-sucking habits seemed to render peculiarly fit to act the part of intermediary host. Without entering into details I will merely say that Manson's hypothesis was fully verified by experiment.

In the case of *Filaria diurna* it is conjectured that certain blood-sucking flies of Old Calabar known as Mangrove flies play the role of intermediary host.

The mode in which the embryos of *Filaria perstans* are supposed to escape from the human body is equally interesting, although it does not involve the agency of any blood-sucking insect. In the region in which *Filaria perstans* is endemic there prevails a skin disease called "craw-craw" attended with pustules, in the contents of which Filariae have been found. It is supposed, with great probability, that the embryos escape with the rupture of the pustules and, in some as yet unexplained manner, although probably through the medium of drinking water, gain access to the human system in which one, or more, attain maturity. It must be confessed, however, that our knowledge of the life history of *Filaria perstans* and *Filaria diurna* is based more upon analogy than fact and that this

will probably continue to be the case until some Manson takes residence in West Africa.

The presence of *Filaria* embryos in the blood does not necessarily give rise to disease, their transverse diameter ($\frac{1}{3500}$ inch) being as a rule such as to enable them to traverse the narrowest channels of the blood and lymph. Occasionally, however, they occlude these vessels and this is due to the fact that the embryos are prematurely born enclosed in a sac or sheath of globular form, the transverse diameter of which is about $\frac{7}{85}$ inch. Disease in man occasioned by the *Filaria* is, therefore, the result of disease in the *Filaria* itself. If the adult female *Filaria* produces the young in a physiological manner they are innocuous to their host; if, through disease or irritation, she brings them forth prematurely, they obstruct the lymph channels and produce one or more of the diseases grouped under the title of filariasis. According to Manson, "it is very certain that in the great majority of instances in which the blood is infested with *Filariae*, no harm whatever accrues."

The principal diseases to which the *Filaria* gives rise are abscesses, lymphangitis, dermatitis and cellulitis, erysipelas, orchitis, chyluria, chylous dropsy of the peritoneum, chylous dropsy of the tunica vaginalis, varicose groin glands, lymph scrotum and elephantiasis.

The disease or rather the symptom that induced me to search for the *Filaria* was chyluria, which is not a common manifestation of filariasis even in the tropics.

It is an interesting fact that the diseases to which the *Filariae* give rise are entirely due to mechanical interference with the circulation of lymph and blood; no toxines, or at least none inimical to man seem to be generated by this parasite and this fact is in marked contrast to what is observed in the ordinary infectious diseases. In the latter, as is well known, the products of bacterial activity are intensely toxic. I would venture to suggest, in explanation of this anomaly, that excretory products diminish in toxicity to man in direct ratio with the ascent in the scale of being of the organism that discharges them.

The most remarkable fact in connection with the habits of *Filaria nocturna* is that it is found in the superficial capillaries solely or chiefly during the evening and night. On several occasions I have examined the blood of my patient at noon or thereabouts and have found the parasites either absent altogether or very sparsely present; whereas at night they have always been abundant. This

"filarial periodicity," as it is called, has been carefully studied by Manson who found that toward sunset the embryos "begin to enter the general circulation. Gradually, as the night wears on, their numbers increase. About midnight they are most numerous. As morning approaches they get fewer and fewer, and by 8 or 9 A. M. they have disappeared." This periodicity is wonderfully adapted to facilitate the escape and further development of the embryo through the medium of the mosquito. Various theories of the cause of "filarial periodicity" have been advanced but none of them is entirely satisfactory. The most satisfactory of them is that which correlates the habits of the parasite with the sleeping and waking habits of the host. This, however, is simply reiterating the fact without explaining it. That the approach of the embryos to the surface is not entirely due to the somnolent condition of the host is shown by the fact that it begins several hours before bedtime; while, on the other hand, the parasites begin to retire to the deeper vessels hours before the usual hour of rising. It cannot be denied, however, that the condition of sleep has something to do with the approach of the *Filaria* to the surface. This is proved by a celebrated experiment of Dr. Stephen Mackenzie who induced a patient who harbored the *Filaria nocturna* to reverse his usual habits as to sleeping and waking: *i. e.* to remain awake all night, and sleep during the day. While this experiment was in progress the *Filaria* was found in the surface vessels solely or chiefly during the day. The fact that the embryos begin to find their way to the surface several hours before bedtime would seem to indicate that the systemic condition which induces sleep is chiefly vascular and that it is of gradual development.

The refuge of the embryo of *Filaria nocturna* during the day has not, as yet, been discovered. The embryos of *Filaria immitis*, a parasite of the dog, observe a modified periodicity and when fewest in the surface vessels are found in enormous numbers in the blood vessels of the lung. This is not the case with *Filaria nocturna* for Manson has examined blood expectorated from the lungs of a *Filaria* patient by day without finding the embryos and Myers has examined blood withdrawn by aspiration from the spleen and liver during the day, with negative results.

I have elsewhere¹ discussed the question of the treatment of

¹ *Medical News*, May 2d, 1896.

filariasis and will, therefore, confine myself to the statement that there is no drug that will kill the adult parasite, and that even if such a drug were known it would be wisest to refrain from its employment. When the adult worm has its seat in one of the extremities and dies, an abscess usually results; or it is perhaps more correct to say that adult *Filariae* have been found in such abscesses, the presumption being that the latter are caused by the former. If, however, the adult *Filaria* dies in the thoracic duct, with consequent abscess, the result would be of necessity fatal. The only treatment worthy of the name is prophylaxis. *Filaria nocturna* being introduced into the system through the medium of drinking water, it is of vital consequence, in the countries in which filariasis is endemic, to secure a pure water supply by filtration or other means.

As Manson remarks²; "the ultimate disappearance of the filarial diseases is entirely a matter of personal and municipal education"—in other words of "civilization and if any municipal or other body is in want of one more argument for a pure water supply, here is one ready made to their hands."

² Davidson's *Hygiene and Diseases of Warm Climates*.

